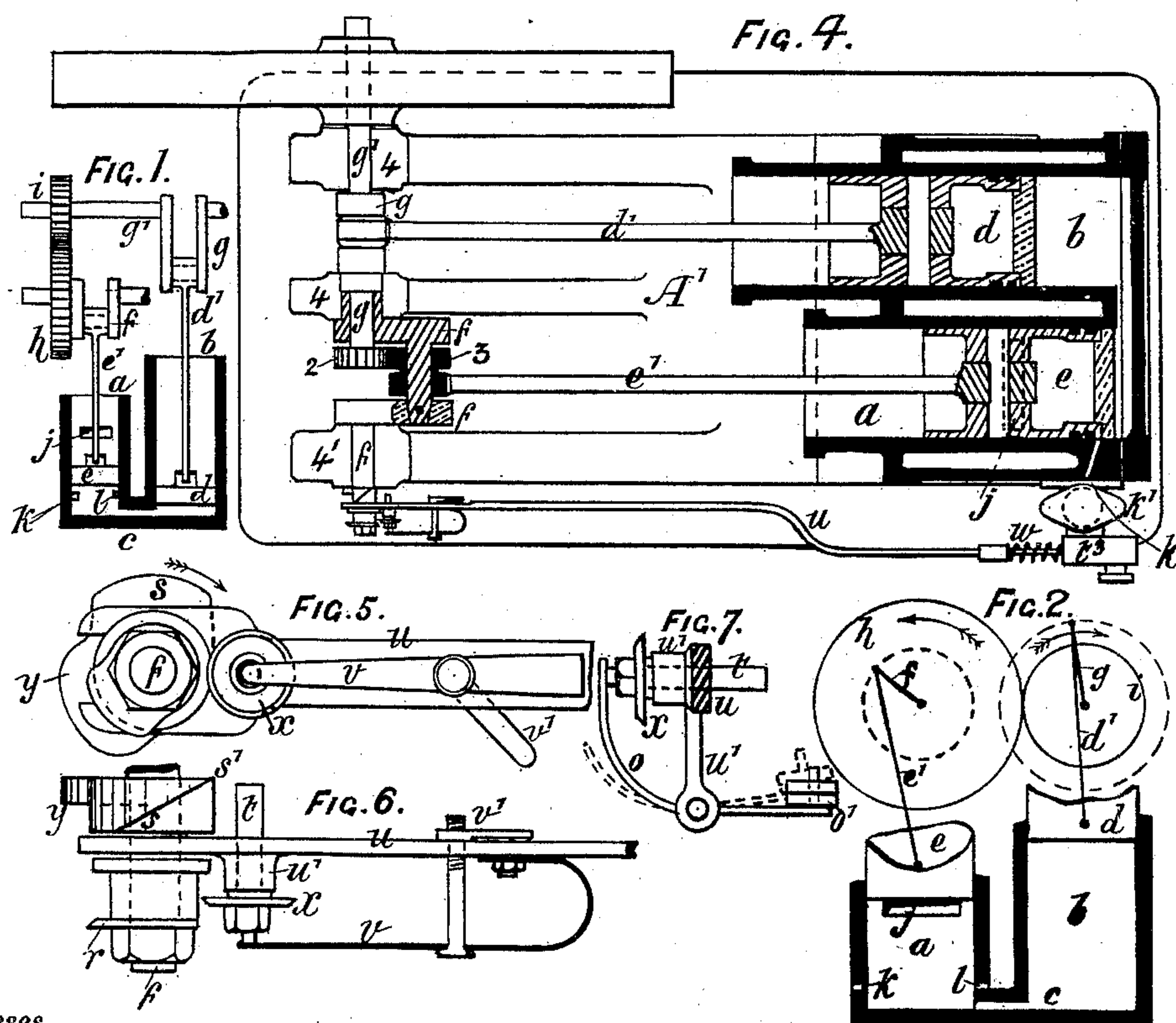
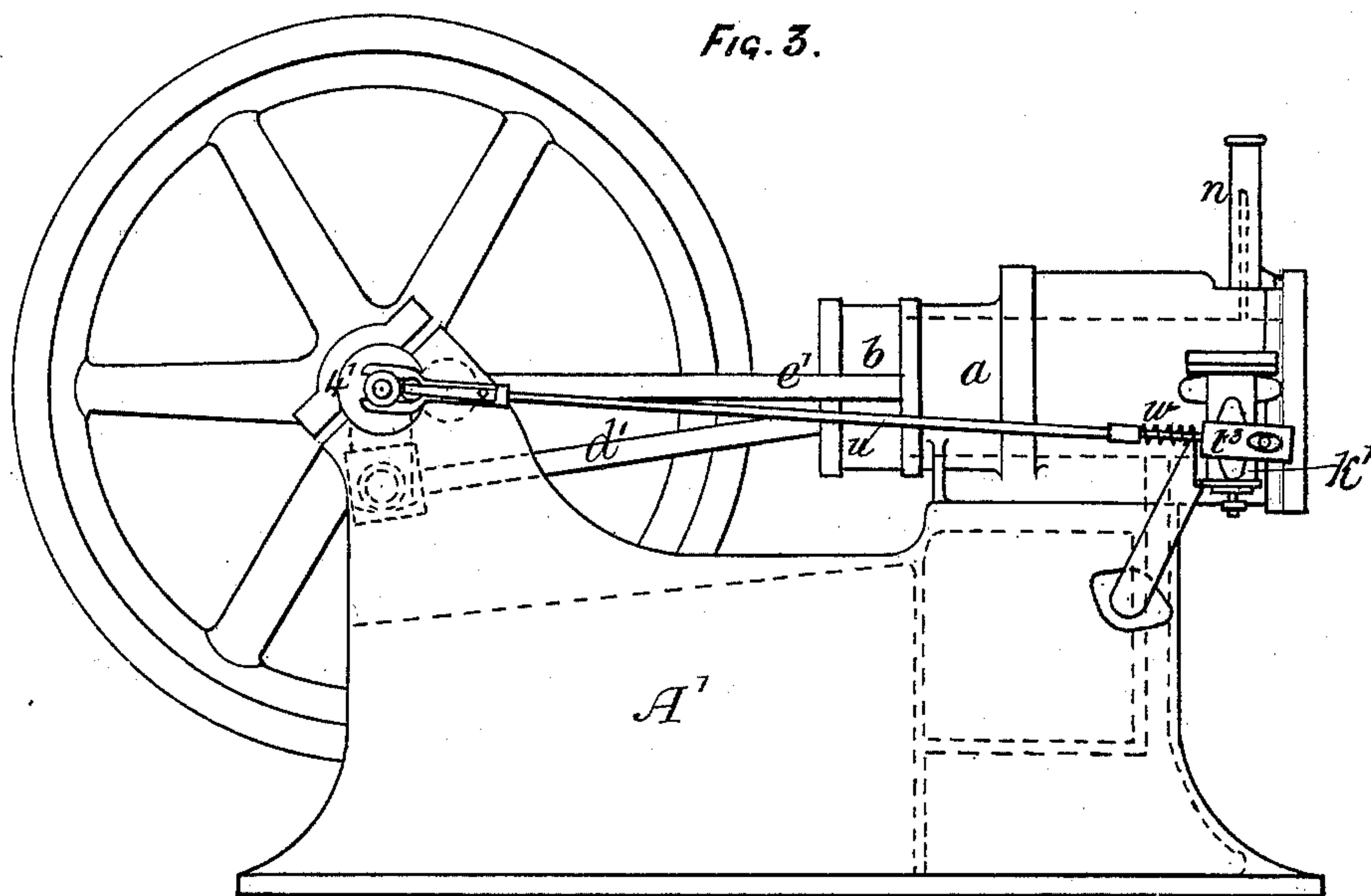


(No Model.)

G. MCGHEE.
GAS MOTOR ENGINE.

No. 432,638.

Patented July 22, 1890.



Witnesses.

James Reid,
Henry Hart.

Inventor, George McGhee
per David Mason, Attorney.

UNITED STATES PATENT OFFICE.

GEORGE MCGHEE, OF GLASGOW, SCOTLAND, ASSIGNOR OF ONE-HALF TO
PETER BURT, OF SAME PLACE.

GAS-MOTOR ENGINE.

SPECIFICATION forming part of Letters Patent No. 432,638, dated July 22, 1890.

Application filed March 4, 1890. Serial No. 342,666. (No model.) Patented in England November 11, 1886, No. 14,578, and March 6, 1888, No. 3,427; in Belgium October 5, 1887, No. 58,727; in France October 5, 1887, No. 173,338, and in Germany November 13, 1887, No. 43,788.

To all whom it may concern:

Be it known that I, GEORGE MCGHEE, a citizen of Great Britain, residing at Glasgow, in the county of Lanark, Scotland, have invented new and useful Improvements in Gas-Motor Engines, (patented in Great Britain by Letters Patent No. 14,578, dated November 11, 1886, and No. 3,427, dated March 6, 1888; in Belgium, No. 58,727, dated October 5, 1887; in France, No. 173,338, dated October 5, 1887, and in Germany, No. 43,788, dated November 13, 1887,) of which the following is a specification.

The invention relates to improvements in gas-motor engines, the objects being to construct a simple and efficient engine and governor therefor.

On the accompanying drawings like letters refer to like parts.

Figure 1 is a sectional view of the engine-cylinders and arrangement of parts under one modification. Fig. 2, diametrically, represents a modified arrangement of same. Figs. 3 and 4 are respectively an elevation and plan of a modification of the engine. Figs. 5, 6, and 7 are respectively an elevation, plan, and transverse view of the principal parts of governor.

Referring to Figs. 1 and 2, the engine comprises two single-acting water-jacketed cylinders *a* and *b*, which may be horizontal, vertical, or otherwise placed, and communicating together at ends by passage *c*, and fitted with pistons *e* *d*, connected, respectively, by rods *e'* *d'* to cranks *f* *g* on shafts (fitted, as usual, in bearings not shown) and geared together two to one, as shown in Fig. 1, by wheel *h* and pinion *i*, so that the piston *e* makes only one stroke to two strokes of piston *d*. The crank-shaft *g'* is fitted with usual fly-wheel. (Not shown.) The cylinder *a* has formed therein an exhaust-port *j*; also near back end thereof the inlet-port *k*, which leads from an ordinary gas and air mixing non-return valve or chamber. Opposite, or on same line with port *k*, is the port *l*, which leads into an ordinary hot igniting-pipe. Instead of both last said ports being separate, the hot pipe may communicate with port *k*, thus dis-

persing with port *l*. As shown at Fig. 1, the rods *d'* *e'* are of unequal length to suit the positions of the shafts *f'* *g'*, which are placed one in advance of the other, while in Fig. 2 the said rods *e'* *d'* are of nearly equal length to suit the position of shafts *f'* *g'*, which are on the same level, the pitch-lines of wheel *h* and pinion *i* being indicated at Fig. 2 by full circles and the crank-paths by dotted circles.

Figs. 3 and 4 represent, respectively, an elevation and plan of the engine, wherein the shafts *f'* *g'* are in the same line supported by the bearings 4 4 4', and combined together by mechanism known as "Watts' sun-and-planet motion." As shown at Fig. 4, the crank-shaft *g'* has fixed on one end the fly-wheel and on the other end a pinion 2, which gears into another pinion 3, of same size, rigidly fixed to end of connecting-rod *e'*, which rod end and pinion 3 embrace crank-pin *f*, the web of which said crank *f* next crank *g* embraces and revolves on shaft *g'*. The other crank *f* is supported by the bearing 4'. By this arrangement of connection between the two cranks the piston *e* makes only one stroke to two strokes of piston *d*. Otherwise the parts of engine are similar to those in the other figures. The hot pipe (indicated by dotted lines) inside funnel *n*, Fig. 3, also mixing-valve *k'* and frame *A'*, are of ordinary construction.

The engine operates as follows: Assuming the space behind pistons *e* *d* to be charged with combustible mixture and the piston *e* just uncovering the ignition-port *l*, as shown at Fig. 1, the mixture enters a hot igniting-pipe and is thereby ignited, the resulting pressure driving piston *d* out full stroke, as shown at Fig. 2, and piston *e* to just above exhaust-port *j*, through which engine now exhausts, the piston *d* meanwhile making back-stroke, while piston *e* moves from and back to port *j*, which it shuts when piston *d* has made full back-stroke. While piston *d* makes another out-stroke, and piston *e* travels inward to inlet-port *k*, combustible mixture is inhaled and compresses the mixture, while the piston

e travels from and back to port *k*, thus just uncovering ignition-port *l* when piston *d* has reached full in-stroke, as shown at Fig. 1, when the cycle begins again, as before described.

The governor, Figs. 5, 6, and 7, comprises a thin steel cam *y* and wide cam *s*, fitted near end of engine slow-shaft *f*. The cam *s* is inclined backward on face from *s'* to *s*, as shown at Fig. 6, so as, when revolving, (as shown by arrow,) to push the sliding stud *t*, fitted in collar *u'* formed on valve-rod *u*, transversely outward against the spring *v*, which presses stud *t* back again when cam *s* has revolved past it. When engine is working at normal speed, the cam *y* now comes against stud *t* and pushes it and also thereby rod *u* (which rod has end forked and capable of sliding on shaft *f*) along with it, thereby opening the gas-supply valve *t*³, Figs. 3 and 4. The rod *u* is pressed back again by a spring *w* when cam *s* has passed stud *t*, thereby shutting gas-valve. The speed of engine, and thereby of revolution of cam *y*, being variable while the action of spring *v* is constant, the stud *t* would sometimes not be driven in far enough in time by spring *v* to give a good bearing for cam *y* to drive stud *t* forward, and thereby the stud *t* would be apt to be much worn at end and slip transversely of cam *y*. To obviate this, the stud *t* has fixed thereon a bevel-edged round steel disk *x*, against which sometimes comes the correspondingly inversed beveled edge of a thin cam *r*, fixed on and revolving with shaft *f*. The cam *r* in revolving comes opposite the disk *x* before the cam *y* comes opposite stud *t*. When shaft is revolving at or under normal speed, the cam *r* locks or passes on the outside of disk *x* and keeps it, and thereby also stud *t*, inward, while cam *y* drives stud *t* and also rod *u* forward, thus opening the gas-valve. If engine exceeds normal speed, the action of the spring *v* to press back stud *t* being constant, according as said spring is set by pinching screw and handle *v'*, the cam *r* revolves faster and locks on inside of disk *x* before

said disk has had time to be pressed back and keeps it, and thereby stud *t*, back until cam *y* has revolved past said stud, so that the rod *u* is thus not actuated, and gas-supply valve *t*³ consequently remains shut that cycle. In lieu of using the spring *v* for pressing back the stud *t*, after being pressed out by cam *s*, said spring may be dispensed with and weights used instead, as shown at Fig. 7, which is a transverse section on the rod *u*, Fig. 5, looking to the left. The rod *u* has thus fixed thereon a depending arm *u'*, on which is fulcrumed the bent lever *o*, on or to one end of which are placed weights *o'*. The other end of said lever bears against and presses the stud *t* inward with a force proportional to the weights *o'*, which may be varied.

What is claimed as the invention, and desired to be secured by Letters Patent, is—

1. A gas-engine comprising cylinders *a b*, with ports *j k l* and two pistons *d e*, rods *d' e'*, and crank-shafts *f g*, geared together, two to one, by spur-wheel *h* and pinion *i*, all arranged and combined as described and shown.

2. In a gas-engine, by means of wheels *h i*, geared two to one, the combination of a piston *e*, controlling the inlet, ignition, and exhaust ports *j k l*, with a piston *d* and driving shaft *g'*, substantially as set forth.

3. In a gas-engine having a cylinder *a*, organized with exhaust, inlet, and ignition ports *j k l*, as shown, and controlled by piston *e*, the combination of a motor-piston *d*, so as to make two strokes to one stroke of piston *e*, substantially as set forth and shown.

4. A gas-engine governor comprising a valve-rod *u*, stud *t*, disk *x*, spring *v*, and cams *r s y* on shaft *f*, all arranged, constructed, and operating substantially as set forth and shown.

In testimony whereof I hereby affix my signature in presence of two witnesses.

GEORGE MCGHEE.

Witnesses:

DAVID MASON,
HENRY HART.